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An Extract of a Latin Epistle of Dr. Joel Langelot, Chief Physician to the Duke of Holstein now Regent: Wherein is represented, that by these three Chymical Operations, Digestion, Fermentation, and Triture, or Grinding, (hitherto, in the Authors opinion, not sufficiently regarded) many things of admirable use may be performed. English'd by the Publisher.

After that this Learn'd and Experienced Physician and Chymist had often with himself consider'd, what the Reason might be, Why the chief Chymical Operations had been hitherto contemned, and by some reputed even for Chimæra's; he assims to have found at last, that the true cause thereof is, that the Artists have not made use, as they should, of those means and ways, that would have made them successful.

Now of those means he assureth by his own certain experience these three to be the most eminent and the most admirable for use, viz. *Digestion, Fermentation, and Triture*; operations sufficiently discoursed of, but, in his opinion, little understood as to their efficacy and usefulness, which he here undertaketh to make out by some considerable and un-common experiments; thereby to encourage those that are studious of Chymistry, and to keep them from desisting when they should most pursue their work, as also from despairing of the success of this or that Operation though in appearance dubious.

First then he shews the excellent usefulness of *Digestion* * in

* Compare herewith, what our Noble Philosopher, Robert Boyle, many years since hath publish'd of the great Use of Digestions, namely, in his *History of Fluidity and Firmness*, the first part, Section 12th. printed in London 1661. among other *Physiological Essays*, where he saith: *It is Intimation I shall add for the sake of Philosophers, that barely by long Digestions (and much more if they be helped by seasonably repeated Distillations,) in exactly stop'd Vessels, and a due degree of heat, there may be made in the parts of many bodies, both Vegetable and Animal, so great a change from the state of consistence to that of Fluidity, as these that contenting themselves with ordinary courses of Chymistry, have not had a peculiar curiosity for trials of this nature, will not be forward to expect.* This was also printed in Latin the same year.

the Preparation of the *Volatil Salt of Tartar*. Where having mention'd the difficulties and unsuccessfulness in other Processes, tryed by him, he assures us, That as soon as he made use of a *long Digestion* he succeeded so well, that the very first time he obtained, what he feared he should not have gotten by many *Combustions*; which was, a pure white Volatil Salt of Tartar, leaving behind a few, quite insipid, *feces* of an earthen colour.

To

To this he adds another great use of *Digestions*, in duly preparing the *Essences of Mineral Sulphurs*; instancing by an experiment made upon *Corals*, as most clearly of all representing that great power of Digestions. He poured then some years ago upon fragments of *Red Coral* an Oyl, which among all distilled Vegetables is, as far as he knows, the mildest; desirous to try, whether he could extract a Tincture therewith. But finding after a long time no change at all in the Coral nor Oyle, he laid by all thoughts of it. But having one Winter other things to digest in a digesting Furnace, he thought good to resume that Corallin Operation, and to give the Bolt-head, wherein that matter was yet contain'd, a place there, not without good success. For within a moneths time, when he stirr'd it as he used to do, he perceived, that the bitts of Coral had a higher colour, and were grown softer, yet without any change in the Oyle. He therefore continued the same degree of heat, and after some days saw, to his wonder, That the Corals were altogether dissolved into a *very red Mucilage*, yet the Oyl still swimming upon them in their pristin form, without having received any tincture at all. He did shake the vessel vehemently and often, to see whether he could unite the Oyl with the Mucilage of the Corals; but all was in vain, the Oyl still ascending when the vessel was at rest, and the Mucilage subsiding. Whereupon he tried, whether he could combine them by digestion; but that also not succeeding, he powred off the Oyl (which he found to retain almost its former scent and taste) and powred upon the remaining Mucilage some Tartarised Spirit of Wine, of which by a short digestion it was resolved into a highly red Tincture.

By these two Experiments the Author thinks, he hath made it evident, of what value the hitherto neglected works of Digestion are; as also given a hint of the great efficacy there is in Volatil Salts, if they be fetter'd, and kept from avolation.

Secondly, to shew the power and use of *Fermentation* in Chymistry, he instances first in a *true Volatilization of Salt of Tartar* by means of the same, passing by what he saith he hath perform'd thereby upon *Antimony, Pearls, Coral, &c.* to be communicated hereafter, in his intended full Description of the Operations made in the famous Laboratory of *Gottorp*. He saith then, that to obtain the Spirit of the Volatil Salt of Tartar, he pro-

ceeded thus ; He took of crude Tartar, 2, 3 or more pounds (according to pleasure) and first calcined it slightly and only to some blackness, to have, what is most necessary, a ferment to ferment the Tartar with. Having put this into a large pot, he poured on it so much water, that it stood an inch high above it : Then he gave it at first a gentle fire to make it lukewarm ; which done, he poured into it half a handful of finely pulverised Tartar, and shortly after saw some bubbles arise, that increased more and more. Which perceiving he continued as he had begun, at several times to pour in more powder of Tartar, whereby the fermentation was raised and quickned, the bubbles thereupon rising in so regular an order, as if they had been natural grapes; the colour excepted. But here he was to keep a very exact regiment of the Fire, such as all Fermentation requireth ; and took care also, least by a too copious affusion of the said powder the Ebullition should grow too vehement, and the pot run over. The fermentation ceasing, he put all that was in the pot into an Iron Bolt-head (a Glass one being in danger to be broken,) to which he often apply'd a wet linnen cloath, thereby to hinder a too great boiling up of the fermented Tartar, which else will suddenly run up, and pass into the Recipient it self. Wherefore the fire is also very carefully to be govern'd, and increas'd by little and little ; though at last it must be strong, to force up all the Salt. Which being observ'd by him, he found the gross and feculent Tartar by the said Fermentation so volatilized, that there remain'd not any fixt salt in the *Caput mortuum*. Which he saith he hath experienced more than once. He adds, that the liquor obtained from thence, having much water in it, added for the sake of the fermentation, is also to be much rectified, and that so far, till it appear whitish ; which shews that it holds a due quantity of Volatil Salt. Which Salt, of what value it is, this Author would have us estimate from the testimony of *Van Helmont, c. 15. de Feb. p. m. 780.* and from the wonderful virtue, himself saith to have found in it, both in internal and external affections of the body, and even in Gangreens themselves ; besides that by means thereof he hath prepar'd some essences, which in vain he had tried to make by other *Menstruums*.

Another instance he gives us of the great use of *Fermentation* in *Separating impure and noxious Sulphurs* : which he prescribeth to
 try

try in *Opium*, whereby, according to him, it becomes not only a very safe medicine, but also a highly useful one for very many cases, if rightly used.

Take then, *sait he*, of true Theban *Opium*, sliced, one pound; and pour upon it in a low Cucurbit ten pounds of fresh Juyce of Quinces very ripe, adding to it one ounce of pure and very dry Salt of Tartar; expose it to a gentle heat for a day or two, untill there appear some bubbles, which is a sign of the fermentation at hand. Then, to further the same, add four ounces of sugar very finely pulverised, and observe still such a degree of heat, as Fermentation requireth; which by so doing will duly proceed, and you shall see the *Opium* manifestly rise and dissolve *per minima*; taking heed mean while of the strong-scented stupifying Sulphur, which then is wont to steam out. You'll then also see a part of the impure volatil scum to emerge at the top, & the more terrestrial to subside at the bottom of the vessel; the purer part staying in the middle, which is a red liquor, like a Ruby, transparent; which you are with care to separate, filtrate, and by a due distillation to thicken to the consistence of hony. And this you must again dissolve by an highly rectified Spirit of Wine, filtering it, and digesting it for a moneth, that whatsoever of crude there may yet be in it, may be by that celestial fire ripened and brought to perfection. This Spirit being abstracted to a due consistency, you will find this Essence to be of that virtue, that the fourth part of a grain, or at most half a grain, taken in a proper vehicle, moist or dry, will perform very wonderful things.

Having dispatch't Digestion and Fermentation, he comes to *Trituration*, his last; by which alone he esteems many great and admirable things may be performed in Chymistry. To which he is perswaded he shall very easily obtain the assent of all those, that shall but observe and well consider the two following Operations, both experimented in the Laboratory of *Gottorp*, in the presence of the late Duke *Frederick*, a Prince exceedingly well versed in all kind of knowledge, especially in that of Chymistry.

The first Operation was made upon *Gold*; which, though the most fixed of all bodies we know, was, though it will not yield to Fire nor to any other known dissolvent, master'd by *Grinding*; which he assureth himself to have been an eye-witness

ness of. But this it did by means of a singular Instrument, by him call'd a *Philosophical Mill*, whose structure is thus described.

- Tab. I.
Fig. I
- | | |
|---|--|
| A. A Leaden Head pretty thick. | same, which is square. |
| B. The Axis. | c. d. Here both the Pestles are affixed to the Axis. |
| C. An indented Drum. | e. Here the Pestles are strengthened by a strong Brass-ring. |
| D. A Drum consisting of Coggs. | f. Here both Pestles are strengthened by two Brass-cases. |
| E. A Mortar. | |
| F. Pestles. | |
| G. A Handle, by which the Mill is turn'd. | |
| a. The Superior part of the Axis, which is round. | Both the thick pestles of glass. |
| b. The Inferior part of the | |

Follows the Operation it self.

Put Leaf Gold, as much as you please, cut very small, into a very thick Glass mortar, or into one of Gold, (such an one as the late King of *Denmark*, a little before his death, caused to be made for this operation :) In this Mortar, covered only with paper, lest any dust or other thing should fall in, grind the said gold night and day by an uninterrupted agitation of the Mill, till you see it reduced into a dusky colour. For which grinding there are commonly to be allow'd 14 days and nights. But if you will only work by day, there will need a whole moneth. This done, put the powder into a Retort, not very deep, but shallow, such as the English ones use to be; and drive it by a fire of sand by degrees, but at last by a very strong one; & there will come over a few but very red drops, which being digested either *per se*, or with Tartarised Spirit of Wine, give you a true *Aurum potable*, which is sincere, and un-imbued with any forrain quality.

The Remainder though they could also have easily resolv'd by Grinding; yet they thought good to make an Extract of it by means of their *Philosophical Acetum*, made of *Verdigrease*, Sulphur, and a highly rectified Spirit of Wine, by a long digestion: Whereby they got again a Tincture sufficiently red and of very great virtue. And that little that remained, which was but very little, they reduced into a body by the means of Borax; but it wanted its due weight.

'Tis

'Tis true, *saith our Author*, that at the first view this operation seems to be gross, requiring much time and labour, but little Art; but well considered 'tis highly admirable, being assisted by the wonderful Salt of the Air, as the only Catholic dissolvent. And that that Salt is by the continual Grinding attracted and intermixt, many other Experiments, made by him about it, have taught him, which he reserves for the publication, hereafter to be made of the things done in the Gottorpian Laboratory.

The *second* Experiment of the use of this Grinding, was in a true and genuine preparation of the *Mercury of Antimony*: A process affirm'd not only made by himself before his Prince, but also by the hands of that very experienced Chymist of the Elector of Saxony, *Johannes Kunchelius*: to have more than one string to his bow.

The Operation consists in this; Grind first the *Regulus of Antimony* into an impalpable powder; and to one pound of it, add two pounds of very pure and dry salt of Tartar, and eight ounces of Sal Armoniac; and mix it well together. Then moisten it with some Urine of an healthy man, especially of one that drinks wine, if such may be had; and take care, to have this mixture ground for a whole day together without any intermission by two very strong young men; always, if there want moisture, sprinkling Urine upon it. Then put this mixture into a Bolt head and powre so much Urine upon it, that it may stand three inches high over it, and closing it well, keep it in digestion for a whole moneth, daily shaking it. And if during that time the mass appear to be dry, powre on more Urine. The Digestion being ended, form the matter into globuls with equal parts of beaten glass and calx vive, and dry it in the shade. Of these, extract the Mercury in manner following;

Let there be ready an oblong iron vessel, like a Bolt-head, into which powre cold water, and dig it into the ground: Upon it put an Iron plate with many holes in it, and lay thereon the said globuls well dry'd; Then fit also an Iron head, somewhat flatted, to it, that you may conveniently lay coals thereon, and thus keep a moderate fire for four hours: then increase the fire for as many hours, unto the last. After that, let it cool, and beware, not to stir the vessel digg'd in the ground, nor to pour out the water, before that be altogether cooled;

or else you will loose a great deal of the Mercury; as happen'd, it seems, to our Author, when his Prince, being impatient of delay, commanded the water to be poured out before 'twas time: For the Mercury, being by so strong a fire resolv'd into Atoms; is to be coagulated again by Cold.

This Mercury of Antimony our Author glorieth in, as having prepar'd and handled it with his own hands, and seen it with his own eyes, after the finisht distillation, running in the bottom of the vessel. Neither doth he care, if any do still call it a Non-Entity; or if any unwary Laborants be unsuccessful in the operation. It is sufficient to him, that he hath nothing alledged, but what he hath tryed himself, and candidly described. He wisheth such Operators to consider, how many things there are to be observ'd before and in the operation, and even after it, if you will be certain thereof. Which he saith may plainly appear even by the Operation of the Tartar alone; forasmuch as all Tartar is not equally good, and himself hath met with great diversity of the same: Besides which great care is to be had of the Fermentation it self of the Tartar; for if it be not duly made, the Tartar will not be resolv'd *per minima*; nor will the Grapes be represented in that natural shape they ought to be; nor will all the Salt, (which is the main thing) be volatilized. Further, if perhaps the fire be excessive during the Distillation, much of the Volatil Salt will be burnt up, and it will yield a strong-smelling Spirit.

Having dispatch'd this, the Author subjoyns an accompt, he met with among his Papers, of another way of Operation of *Grinding* of Gold; which though he have not yet tryed, yet it seeming to him very likely to succeed, he scruples not to communicate also. The instrument, to be used therein, he describes thus.

Tab. I.
Fig. II.

- a. *A Mortar of very fine Steel.*
- b. *A body serving for a Pestle, of the same Metal, which is to fit the Mortar, as 'tis delineated in the Figure.*
- c. *Is a small space, where is interposed a golden Plate, half a Ducat thick.*
- d. *The handle, by which the Pestle is to be managed in the work of Grinding, which is to be continued for three weeks; at the end of which the Gold will be resolv'd into a potable liquor.*

This

This way, as it is much simpler, so 'tis by the Author esteem'd much more expedient than the former, by reason of the Sulphury-saline quality of Iron, which by Grinding being open'd and highly subtilized, acts the more powerfully upon the most solid body of Gold, and attracts withall the Salt that is in the Air in greater plenty, than can be done in a Glass or Golden Mortar. And if it be objected, that by that long continued Grinding the steely particles are worn off and commixt with those of the Gold; The Author would have it consider'd, how great a Cognation there is between those Sulphurs, and also, how great is the Use of Digestion, separating the pure from the impure, and withal exciting that occult fire of *Mars*, well known to the true Searchers of Nature; which, being assisted by the *Alcool* of Wine, is able to concoct the little immature portion to a due maturity.

An Extract of a Letter of Mr. Lister to the Publisher, both enlarging and correcting his former Notes about Kermes; and withal insinuating his conjecture of Cochineil's being a sort of Kermes.

Sir,

WE must correct as well as enlarge our Notes concerning *Kermes**; and yet there will be much difficulty in resolving the question concerning the Original and Efficient of *Kermes*. These things are certain:

* Compare herewith, what was publish'd in No. 71. p. 2165, No. 72. p. 2177, especially No. 73. p. 2196.

1. That we have this year seen the very Gumm of the *Apricock* and *Cherry-lawrel-Trees* transudated, at least, standing in a Crystal-drop upon some (though very rarely) of the tops of these *Kermes*.

2. That they change colour from a yellow to a dark-brown: that they seem to be distended and to wax greater, and from soft, to become brittle.

3. That they are fill'd with a sort of *Mites*; that small powder (which I said to be Excrement,) being *Mites* as well as that *Liquamen* or softer pulp (which I took to be Bees-meat;) concerning both which particulars I am pretty well assur'd by my own, and also by my ingenious friend, Dr. *Johnson of Pomfret's* more accurat Microscopical Observations.

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4. That

Fig. II.

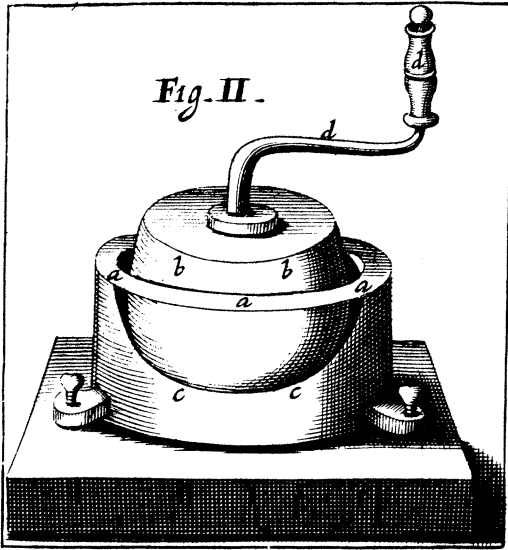


Fig. I.

